



NATIONAL WEATHER SERVICE WINTER WEATHER EXPERIMENTS

*Information Briefing to
the Science and Technology Committee
of the NWS Corporate Board*

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Goals of Presentation

- History of the WWE
- Plans for this year's WWE
 - ▶ *Expansion into WR and SR*
- Collaboration Lessons Learned

HISTORY OF WWE



- **The first WWE resulted from the outcome of NWS performance review for Jan 2000 Blizzard**
 - ▶ *Mechanism needed for improving forecasts for winter storms*
 - ▶ *ER and NCEP proposed a Winter Weather Experiment to improve guidance procedures/products to support winter weather watches and warnings issued by the WFO*
 - ▶ *Provide WFO ability to influence NCEP products before they are released through a collaborative forecast process between WFOs and HPC*
 - ▶ *Assess SREF for providing Watch Guidance products*

WWE I

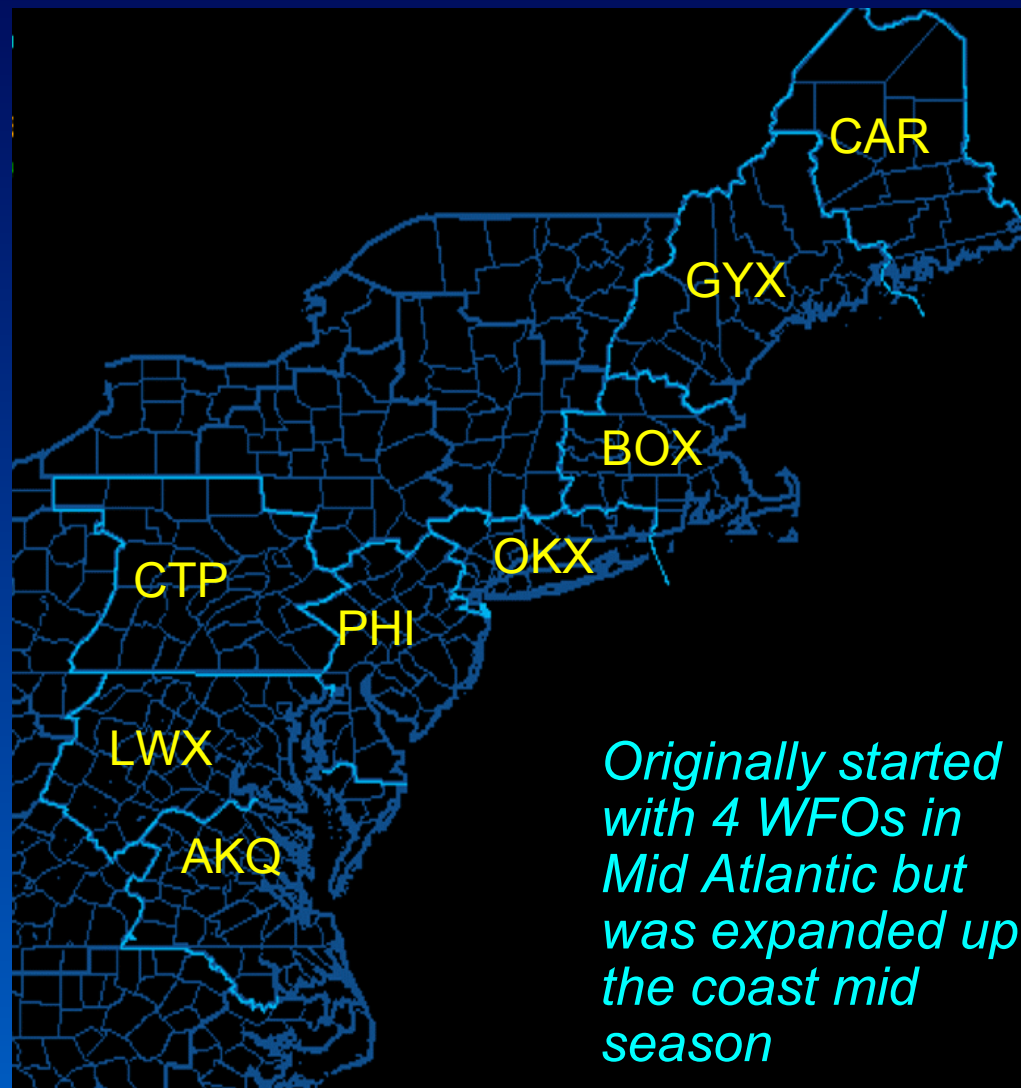
■ GOALS

- ▶ *Based on collaboration between HPC and WFOs minimize the chance of another Jan 2000 event*
- ▶ *Test SREF application to winter weather forecasting*
- ▶ *Test HPC's new collaborative role to facilitate a fully coordinated short- and medium- range forecast product suite in preparation of the NDFD*

■ PARTICIPANTS

- ▶ *NCEP (EMC, NCO, & HPC)*
 - HPC provided SREF based suite of enhanced winter weather graphics
- ▶ *ER WFOs*
 - Used HPC graphics to center a **text chat** based collaboration session
- ▶ *OCWWS*
 - Monitoring and feedback

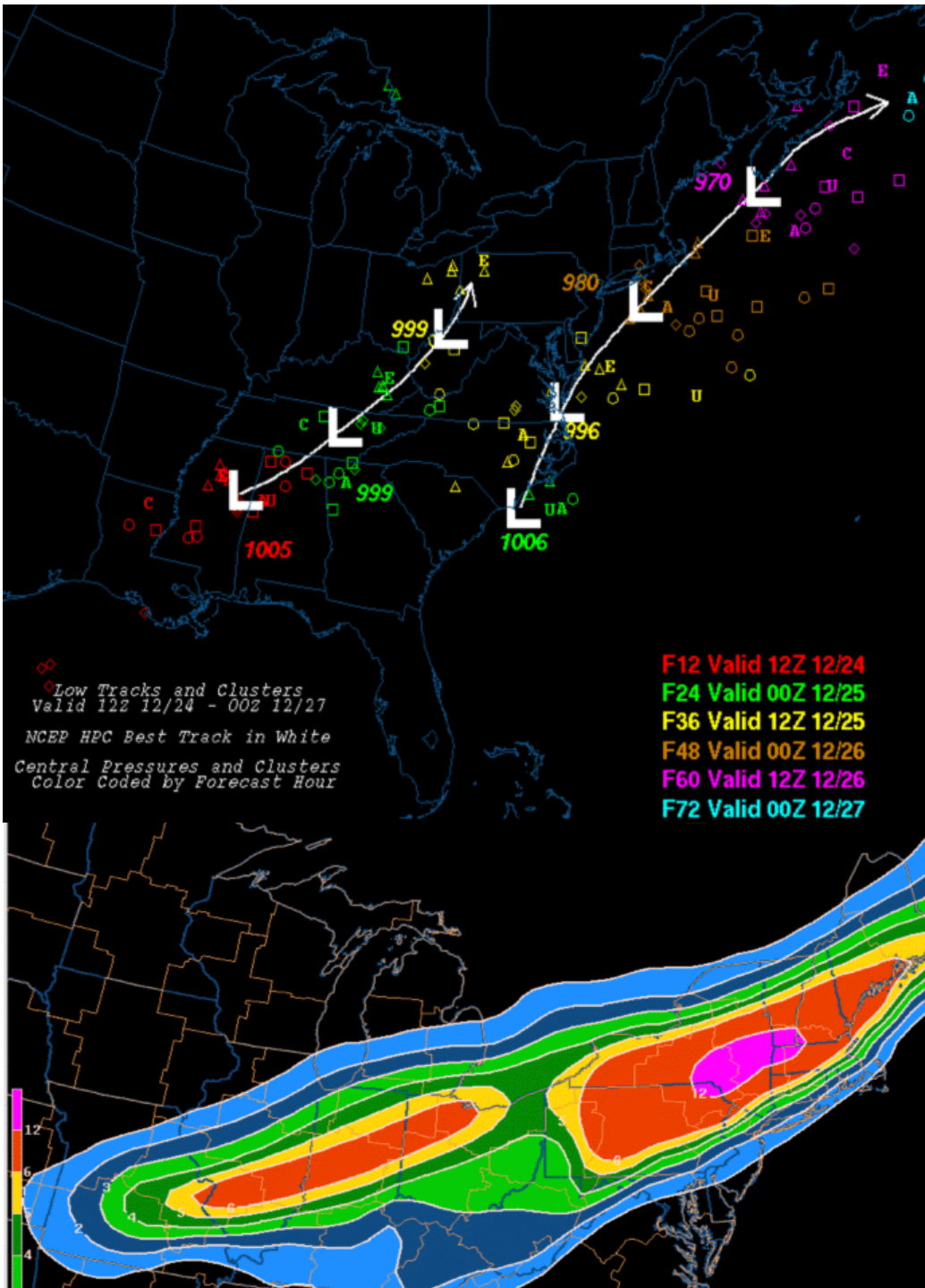
■ WWE conducted in parallel with operations



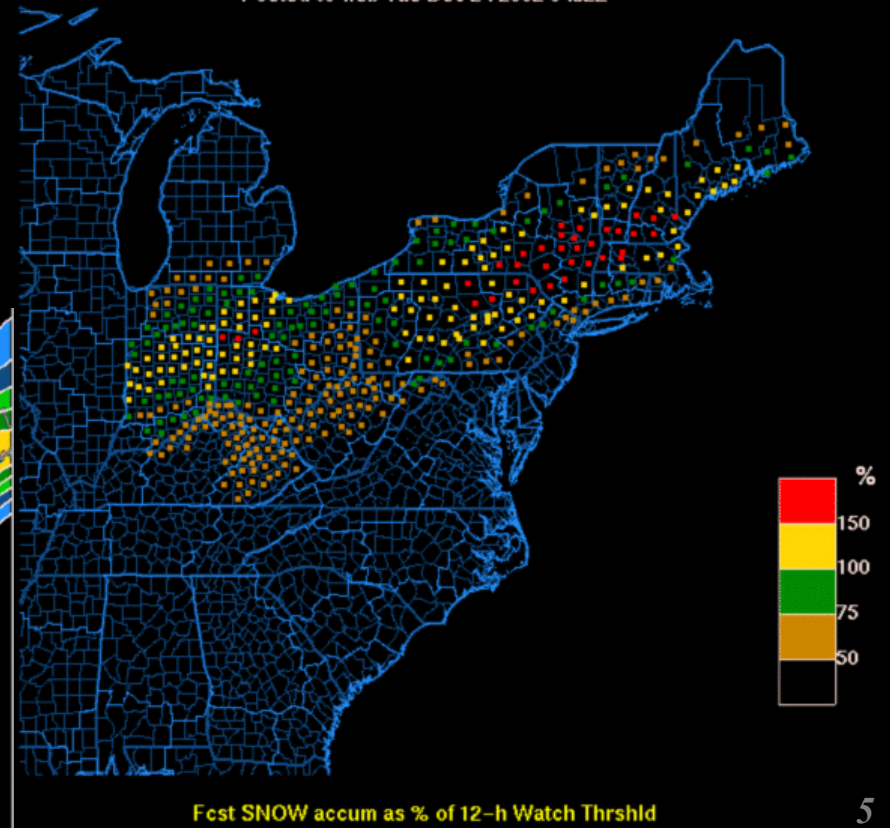
WHAT WAS PRODUCED ?

Primary WWE Product Suite (posted to web site)

- **Low Tracks Graphic (top left)**
- **Event Total Accumulation Graphic (bottom left)**
 - *Individually for Snow (snow + sleet) & Ice amounts*
- **Winter Storm Watch/Warning Potential Graphic (bottom right)**
 - *Individually for Snow and Ice thresholds*



NCEP HPC Winter Storm Watch Potential Guidance
Potential Based off Storm Total from
12z TUE DEC 24 2002 to 12z THU DEC 26 2002
Posted to web Tue Dec 24 2002 0432Z



NWS ER REVIEW

BENEFITS OF WWE I

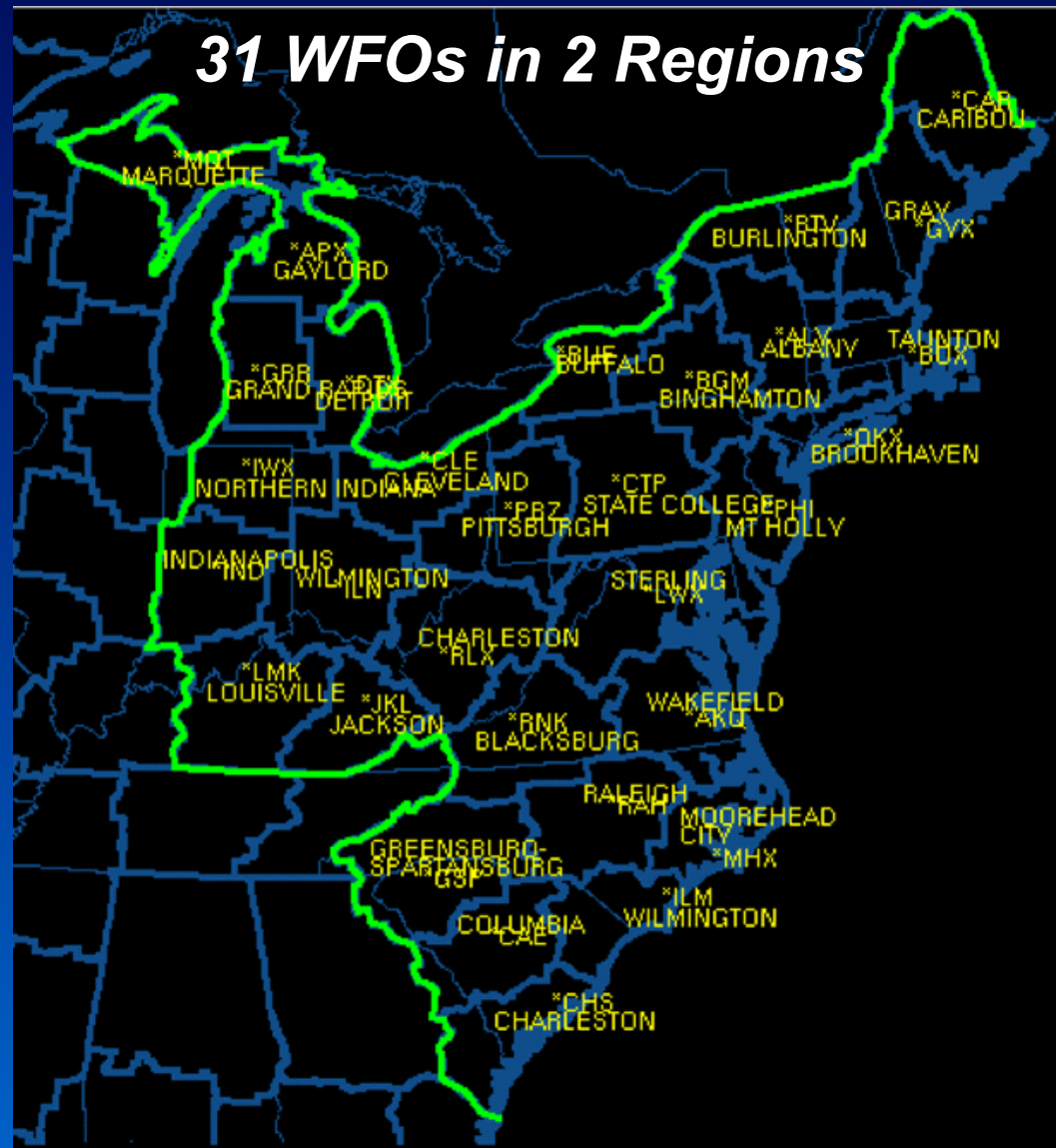
- **Despite low frequency of winter weather events over the WWE I area, useful insights were gained**
 - ▶ *HPC contributions were positive and helpful*
 - ▶ *Snowfall and Storm Track Graphics were very helpful*
 - ▶ *A large-scale perspective can be very useful to the WFOs*

WWE ISSUES IDENTIFIED BY ER

- **Coordination Process “Simply too long...”**
 - ▶ *Lack of audio a definite negative - “some people are slow typists”*
 - ▶ *WWE draws attention away from other tasks*
 - *Other coordination calls take time as well*
 - ▶ *Must strive to keep process less than 15 minutes*
 - *Expansion of WWE may slow the process*

WWE II

- **Goals of experiment expanded**
 - ▶ *Evaluate workload associated with collaborative process involving HPC and more WFOs*
- **Project oversight by OCWWS**
 - ▶ *Generically the same time lines as WWE I, but with more WFOs*
- **Added use of audio to support collaboration**
 - ▶ *In addition to a chat room*
- **Collaboration process reduced to 15 minutes**
 - ▶ *Remained outside AWIPS*
- **Verification procedure invoked in an attempt to establish benefit of WFO participation in WWE**



WWE II CONSIDERATIONS

- **More WFOs participating**
 - ▶ *Increased from 8 to 31*
 - ▶ *Had to anticipate two concurrent but geographically spaced events*
- **Incorporate ER recommendations from WWE I**
- **Structure WWE II in line with a NDFD paradigm**
 - ▶ *Not fully schedule driven*
 - ▶ *Assess information as it becomes available*
 - ▶ *Conduct collaborative activities early in the forecast process*
 - ▶ *Make NWS products consistent*
- **WWE II conducted in parallel with operations**
 - ▶ *NCEP reallocated 4 FTEs to conduct this experiment and provide other NDFD-related support*

WWE II EVALUATION

■ **Verification Results**

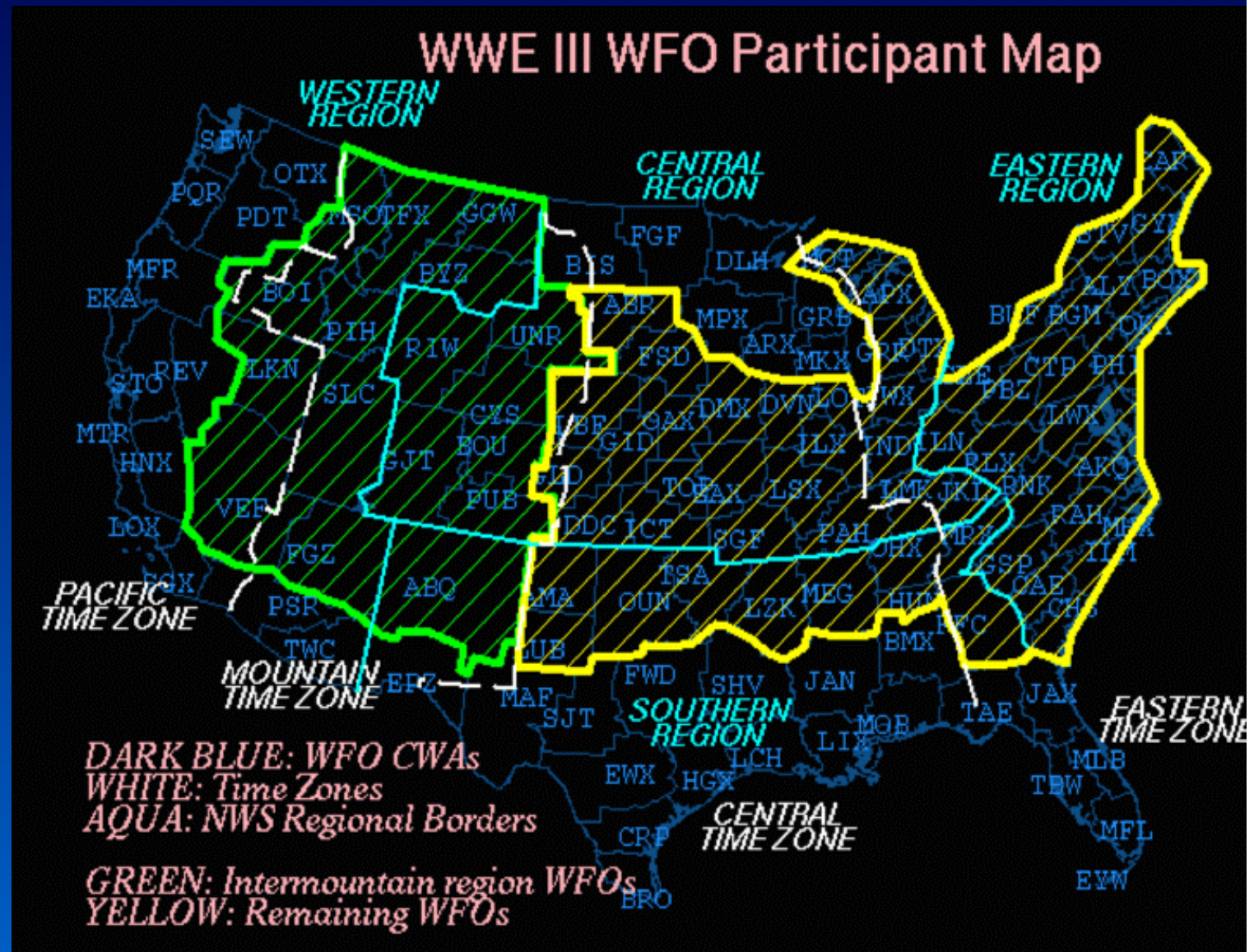
- ▶ **Objective verification of graphics generated by HPC showed they were an improvement over both the operational and ensemble output**
- ▶ **Subjective feedback from WFOs and HPC strongly indicated the process is beneficial to BOTH WFOs and NCEP**
- ▶ **Duration of collaboration call was appropriate**
- ▶ **Comparison of WFO winter storm watch/warning verification scores were somewhat dichotomous**
 - WWE II WFOs as a whole showed improvement as compared to the previous year
 - Individually, however, CR WFO scores went down while ER scores improved, breaking records
- ▶ **HPC and WFOs felt the chat room did not enhance benefits of the audio call**

■ **Recommendations**

- ▶ **ER - continue WWE II into this year**
 - Drop the chat room
- ▶ **CR - ditto, but expand to include the I-80 and I-70 corridor**
 - Drop the chat room
- ▶ **SR - requested support for mixed precip events on I-40 corridor**
- ▶ **WR - requested similar support tailored for intermountain region WFOs**

WWE III

- Goals remain consistent with previous WWEs
- Expansion from 31 to 75 WFOs and from 2 to 4 Regions
- Explore best collaborative methods crossing different time zones
- No chat room specific to WWE - just use 12 Planet

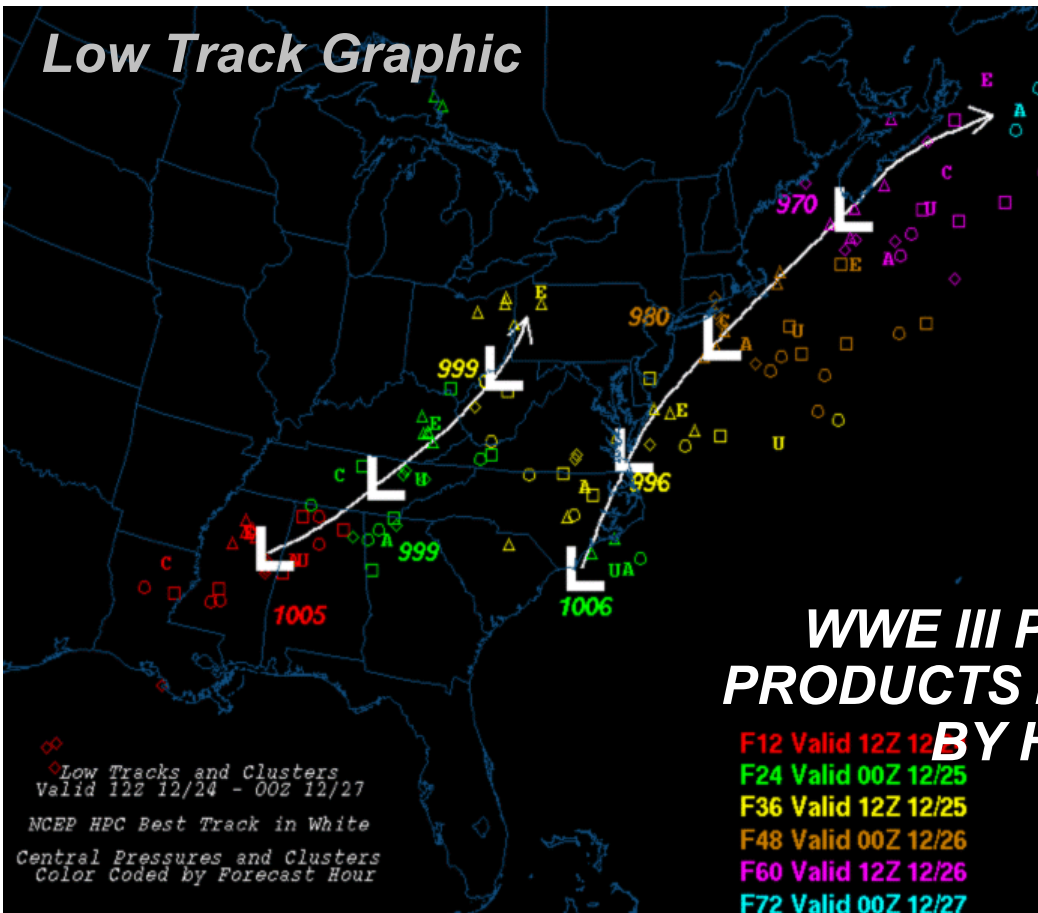


WWE III CONSIDERATIONS

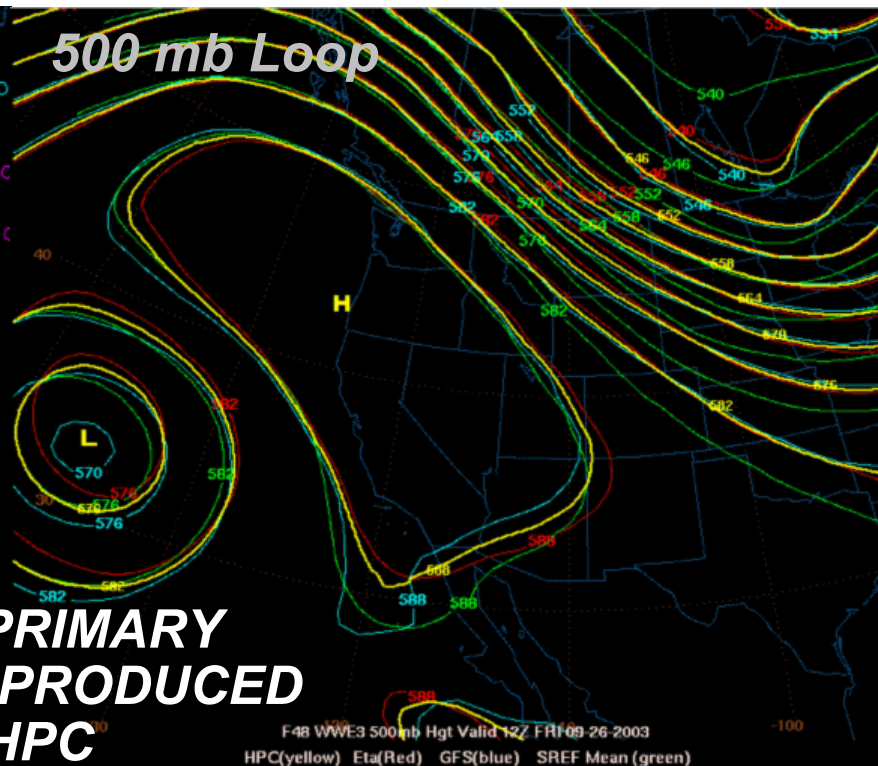
So far so good, but need to build on what's worked...

- **Over twice as many WFOs as last WWE**
 - *How best to conduct collaboration for either one event covering numerous WFOs or multiple events covering separate regions of the WWE III area*
- **Multiple time zones**
 - *Optimal collaboration times different between WFOs*
- **Varying sensitivities and local climates among WFOs**
 - *What's worked in previous WWEs may not work in the expansion areas*
- **Expand use of SREF and operational model guidance**
- **Must keep process simple but useful for WFOs**
 - *Must ensure effective and efficient collaboration for WFOs and NCEP*
- **Must keep it manageable at HPC**
 - *Assess HPC resource requirements*
- **Experiment should help answer critical questions NWS has entering NDFFD era**

Low Track Graphic



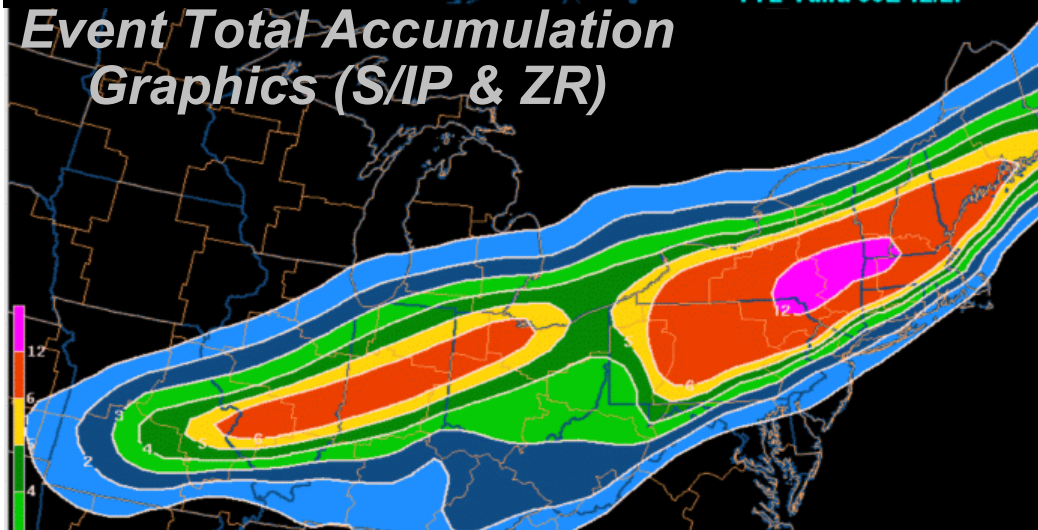
500 mb Loop



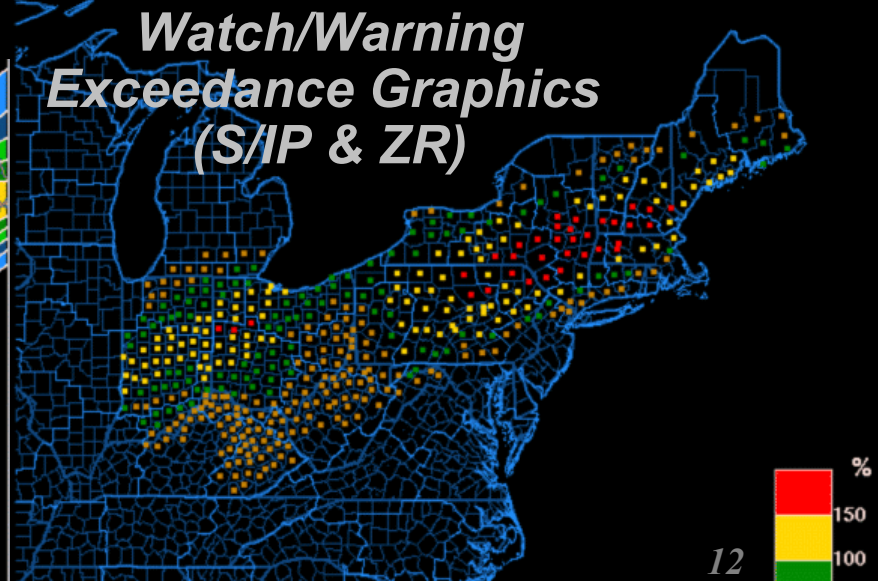
WWE III PRIMARY PRODUCTS PRODUCED BY HPC

NCEP HPC Winter Storm Watch Potential Guidance
Potential Based off Storm Total from
12z TUE DEC 24 2002 to 12z THU DEC 26 2002
Posted to web Tue Dec 24 2002 0432Z

Event Total Accumulation Graphics (S/IP & ZR)



Watch/Warning Exceedance Graphics (S/IP & ZR)



COLLABORATION CALL

Premise

- **The collaboration calls are...**
 - ▶ *15 minutes in length*
 - ▶ *An opportunity to get all participants impacted by an event on the same page early in the forecast process*
 - *Viewing the latest operational and ensemble output (modified by forecasters)*
 - *Verbally sharing considerations with neighbors in a short time frame*
 - *This includes HPC*
- **The collaboration calls are not...**
 - ▶ *The arena where final watch/warning decisions are made*
 - ▶ *Where HPC dictates or suggests configuration of watch/warnings*
 - ▶ *Long enough in time to hold in depth scientific discussion of an event*

EVALUATION OF WWE III

- **Conducted in a similar fashion to WWE II**
 - ▶ *Objective verification of HPC generated graphics*
 - ▶ *Comparison of WFO watch/warning stats*
 - ▶ *Review of feedback solicited from WFOs and HPC*

Summary: Collaboration Lessons Learned

■ Time

- ▶ *Should be early in the forecast process (but not too early!)*
 - *Early enough before getting too deep into grid edits*
 - *But not so early most participants are only in listening mode*

■ Frequency

- ▶ *Twice per day seems to be sufficient*

■ Duration

- ▶ *Short and sweet (15 minutes seems to be appropriate)*

■ Structure

- ▶ *Facilitated collaboration most helpful*
- ▶ *Allow input from all, but must be tactful enough to keep call moving*
- ▶ *Facilitator should lead and not “strong arm” participants into a decision*

■ Mechanics

- ▶ *Voice communication most efficient*
- ▶ *Chat rooms seem to supplement audio, but not replace it*
- ▶ *Avoid having to monitor multiple chat rooms*
- ▶ *Avoid having participants in multiple collaboration calls*

■ Potential Directions

- ▶ *Streaming video as a prep for participation (or VISIT software as a proxy)*
- ▶ *Web cams ???*
- ▶ *Targeted Collaboration (instead of fixed times over fixed areas)*

Concluding Remarks

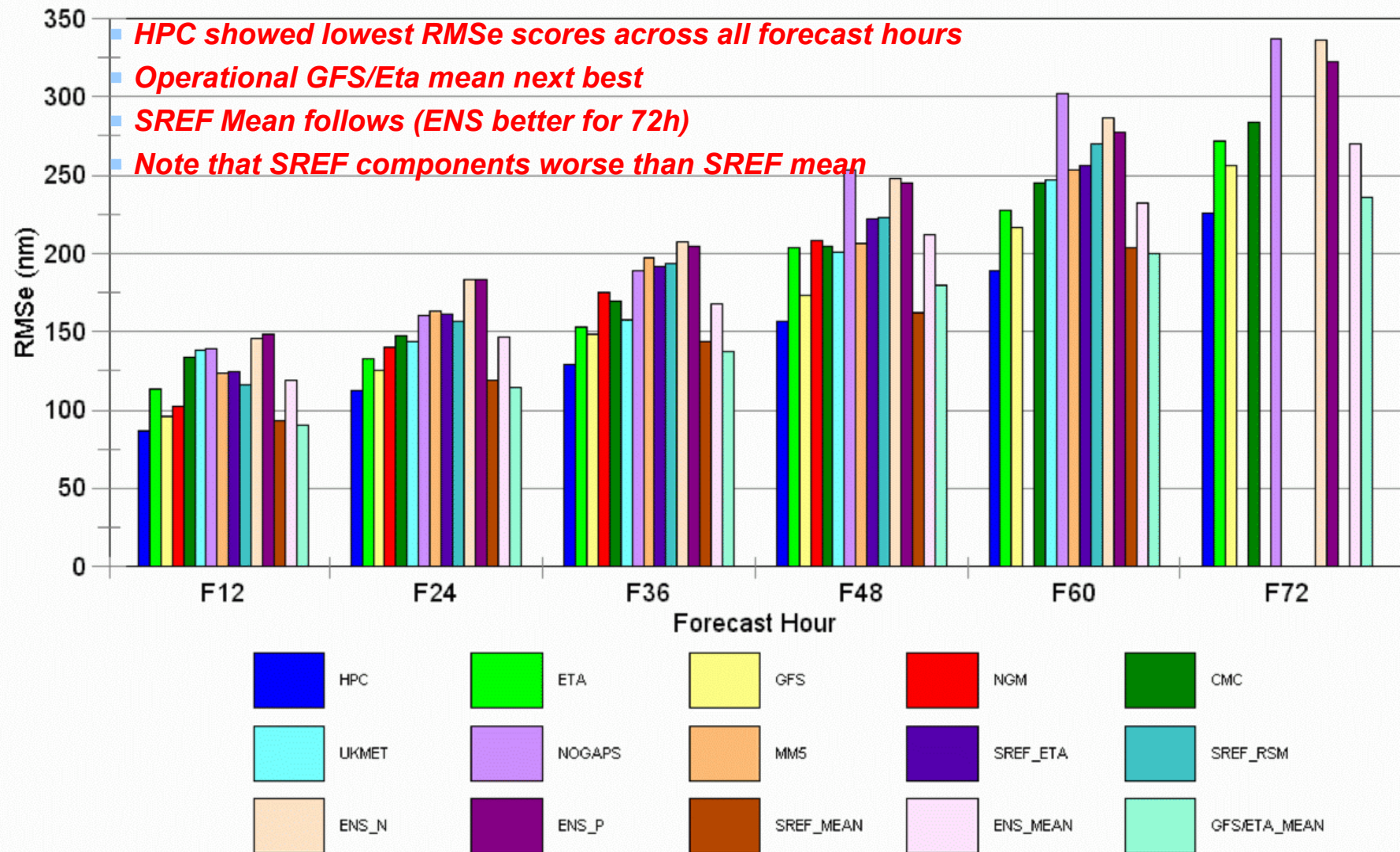
- **WWE III is already in progress**
- **WWE III procedures will be adjusted as feedback warrants**
- **Doubled in size compared to last year**
 - ▶ *Includes all CONUS regions*
 - ▶ *Includes extensive mountainous areas*
- **OCWWS will lead assessment of WWE III**

Background Slides

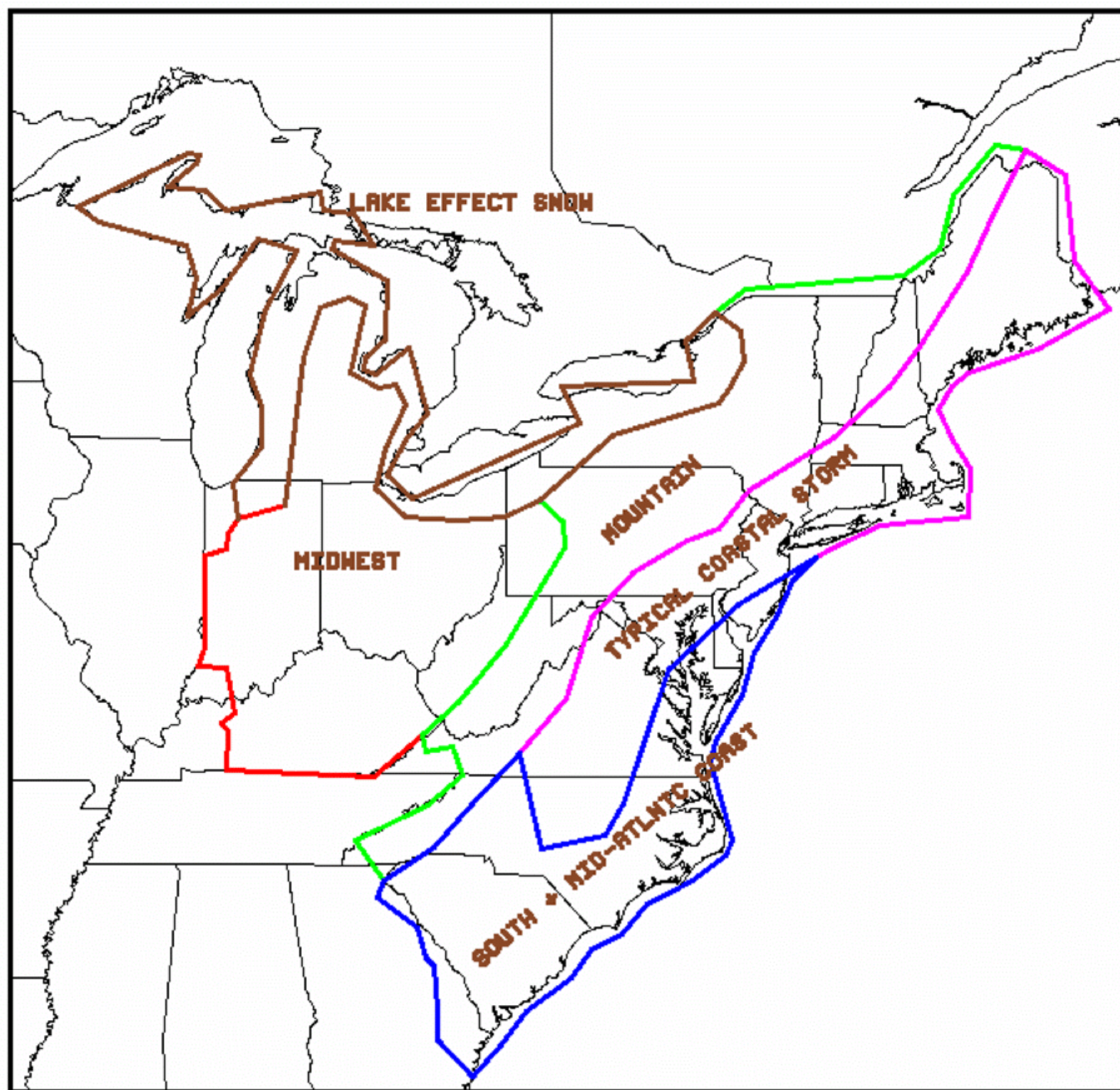
Verification Results of HPC Produced Graphics for WWE II

HPC WWE LOW TRACKS VERIFICATION

Forecast Low Track vs Actual Low Track



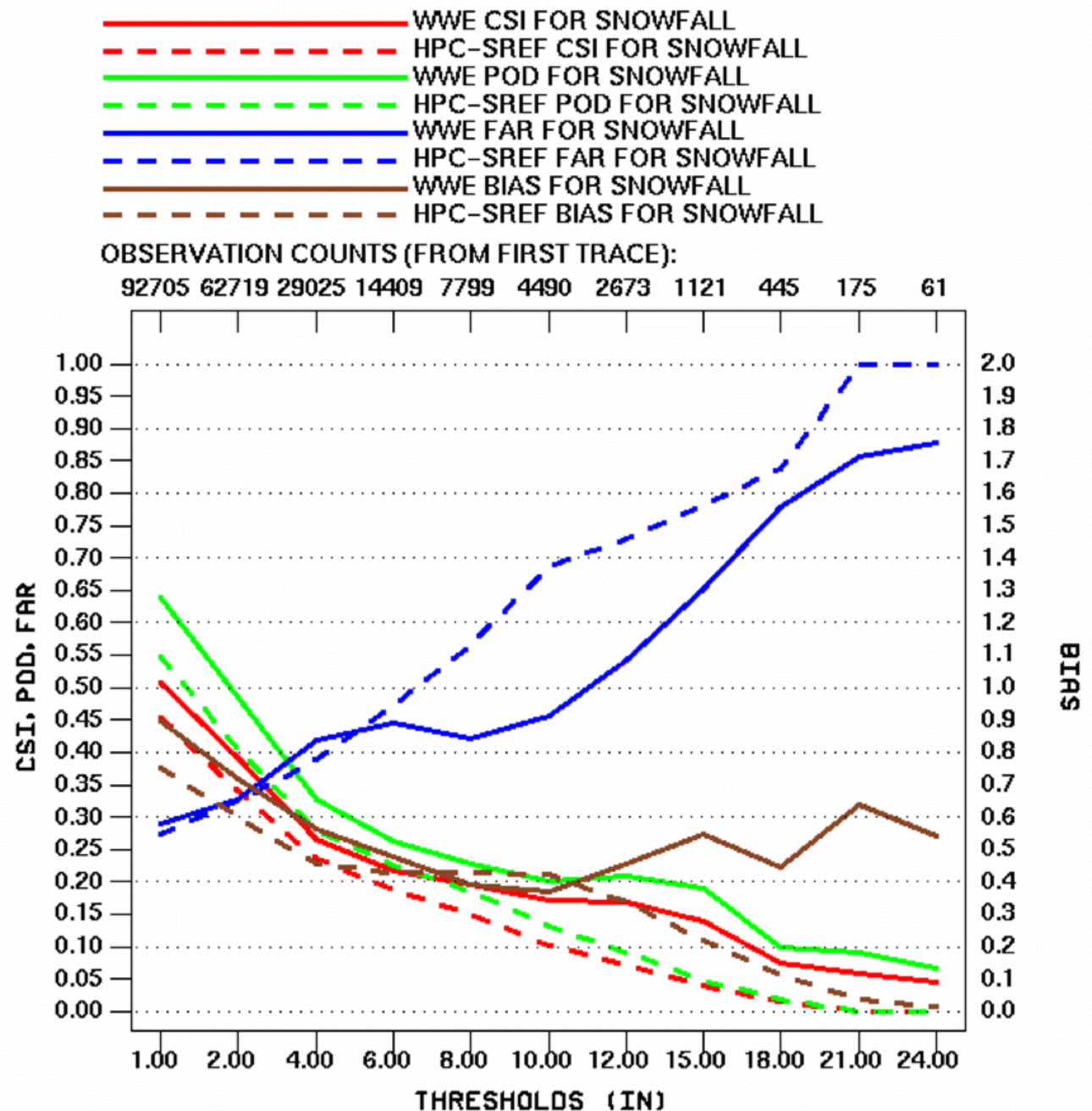
On average 250 cases per forecast hour (drops to about 175 after forecast hour 48)



LIFE VEGETATION REGIONS

- The starting point accumulations are dashed (HPC-SREF)
- The HPC WWE forecaster accumulations are solid
- Note the scale on left is for CSI, POD, FAR while on right is for Bias
- The WWE CSI and POD is always better indicating that the changes made by HPC forecaster are improvements
- However, there is a comparatively low bias in the 7-11" range and a higher bias in the 2-6" range

SCORES FOR ALL EVENT TOTAL FORECASTS VERIFYING ON 20021112 THRU 20030402
OVER ENTIRE WWE REGION



- The starting point accumulations are dashed (HPC-SREF)
- The HPC WWE forecaster accumulations are solid
- Note the scale on left is for CSI, POD, FAR while on right is for Bias
- Overall HPC made less dramatic improvements for ice as compared to snow/sleet.
- In fact little improvement was offered for thresholds higher than .25"

SCORES FOR ALL EVENT TOTAL FORECASTS VERIFYING ON 20021112 THRU 20030402
OVER ENTIRE WWE REGION

